JONARDON GANERI

ANCIENT INDIAN LOGIC AS A THEORY OF CASE-BASED REASONING

It was Henry COLEBROOKE[1] who first brought Indian logic to the attention of the English philosophical world, announcing in a famous lecture to the Royal Asiatic Society in 1824 his discovery of what he called the 'Hindu Syllogism'. COLEBROOKE's 'discovery' consisted in fact in a translation of an ancient Indian treatise, the *Nyāya-sūtra*. It dates from around the 1st or 2nd century CE, and is said to be the work of Gautama Akṣapāda. Scholars are now inclined to regard it as the amalgamation of two earlier works on philosophical method, one a treatise on the rules and principles of debate, the other a discussion of more general issues in epistemology and metaphysics. In a section on the proper way for a debater to set out their argument, the *Nyāya-sūtra* prescribes a five-step schema for well-formed argument, and it is this schema that COLEBROOKE identified as the Indian syllogism. We now know much much more that COLEBROOKE about the historical development of Indian logic. He, for instance, was unaware of the informal logic and anticipations of propositional calculus in the *Kathā-vatthu*[2], or the theories of the Buddhists Vasubandhu, Diṅnāga and Dharmakīrti on formal criteria for inference[3]. And scholars had yet to learn the complexities of the later logical school of Navya-Nyāya, with its intriguing treatment of negation, logical consequence and quantification.[4] Nevertheless, in spite of COLEBROOKE's lack of acquaintance with the historical context, he and those who followed him were right to see the *Nyāya-sūtra* as a treatise of fundamental importance in Indian logical thinking, and I would like to pick up and continue the thread of their discussion. I want to argue that the *Nyāya-sūtra* presages a transformation in Indian thinking about logic. And this in two inter-related respects: in the beginnings of a shift of interest away from the place of *argumentation* within dialectic and debate and towards a greater concern with the more formal properties of sound *inference*; and in a parallel and correlated shift from *case-based* to *rule-governed* accounts of logical reasoning. The logic of *ancient* India, I contend, is an informal logic of case-based reasoning.

In the *Nyāya-sūtra*, there is a more systematic discussion of the categories and methods of debate than in earlier debating manuals. Three kinds of debate are distinguished: good or honest debate (*vāda*),

Journal of Indian Philosophy, 33–33, 2002.

tricky or sophistical debate (*jalpa*) and a refutation-only debate (*vitaṇḍā*):

> Good debate (*vāda*) is one in which there is proof and refutation of thesis and antithesis based on proper evidence (*pramāṇa*) and presumptive argumentation (*tarka*), employing the five-step schema of argumentation, and without contradicting any background or assumed knowledge (*siddhānta*).
> Tricky debate (*jalpa*) is one in which, among the features mentioned before, proof and refutation exploit such means as quibbling (*chala*), false rejoinders (*jāti*), and any kind of clincher or defeat situation (*nigraha-sthāna*).
> Refutation-only debate (*vitaṇḍā*) is one in which no counter-thesis is proven. (*Nyāya-sūtra* 1.2.1–3).

Here is our first reference to the Indian five-step inference pattern. It is a schema for proper argumentation among disputants who are engaged in an honest, friendly, noneristic, and balanced debate (*vāda*). In the dialectical context in which such arguments are embedded, a proponent attempts to prove a thesis and to refute the counter-thesis of the opponent, both parties drawing upon a shared body of background knowledge and received belief, and using properly accredited methods for the acquisition and consideration of evidence. The aim of each participant in the dialogue is not victory but a fair assessment of the best arguments for and against the thesis. In Indian logic, *vāda* represents an ideal of fair-minded and respectful discourse. By contrast, in a tricky debate (*jalpa*), underhanded debating tactics are allowed, and the aim is to win at all costs and by any means necessary. The third kind of debate, the refutation-only debate (*vitaṇḍā*), is the variety of dialogue preferred by the sceptics—to argue against a thesis without commitment to any counter-thesis. It is not entirely clear whether this is a type of good or tricky debate.

The aim, in a good debate between friends, is the assessment of the best arguments for or against the thesis. And that leads to the question: how are arguments to be assessed or evaluated? Are the criteria for assessment formal, to do only with the form of the argument schema itself; or are they informal, pragmatic criteria, according to which arguments have to be evaluated as good or bad with regard to their contribution towards the goals of the dialogue within which they are embedded?[5]

With this question in mind, let us look at the five-step proof pattern. The proper formulation of an argument is said to be in five parts: tentative statement of the thesis to be proved (*pratijñā*); citation of a reason (*hetu*); mention of an example (*udāharaṇa*); application of

reason and example to the case in hand (*upanaya*); final assertion of the thesis (*nigamana*). An unseen fire is inferred to be present on the mountain, on the basis of a plume of smoke; just as the two have been found associated in other places like the kitchen. The terms used here are defined in a series of admittedly rather gnomic utterances (*Nyāya-sūtra* 1.1.34–39):

1.1.32 'the parts [of an argument scheme] are thesis, reason, example, application and conclusion' (*pratijñā-hetûdāharaṇôpanaya-nigamanāny avayavāḥ*).

1.1.33 'the thesis is a statement of that which is to be proved' (*sādhya-nirdeśaḥ pratijñā*).

1.1.34 'the reason is that which proves what is to be proven in virtue of a similarity with the example' (*udāharaṇa-sādharmyāt sādhya-sādhanaṁ hetuḥ*).

1.1.35 'again, in virtue of a dissimilarity' (*tathā vaidharmyāt*).

1.1.36 'the example is an illustration which, being similar to that which is to be proved, has its character' (*sādhya-sādharmyāt tad-dharma-bhāvī dṛṣṭānta udāharaṇam*).

1.1.37 'or else, being opposite to it, is contrary' (*tad-viparyayād vā viparītam*).

1.1.38 'the application to that which is to be proved is a drawing in together (*upasaṁhāra*) 'this is so' or 'this is not so,' depending on the example' (*udāharaṇâpekṣas tathêty upasaṁhāro na tathêti vā sādhyasyôpanayaḥ*).

1.1.39 'the conclusion is a restatement of the thesis as following from the statement of the reason' (*hetv-apadeśāt pratijñāyāḥ punar-vacanaṁ nigamanam*).

The basic idea is that an object is inferred to have one (unobserved) property on the grounds that it has another, observed, one: 'there is fire on the mountain because there is smoke there.' The most distinctive aspect of the schema, though, is the fundamental importance given to the citation of an example, a single case said either to be similar or else dissimilar to the case in hand. Suppose I want to persuade you that it is about to rain. I might reason as follows: 'Look, it is going to rain (thesis). For see that large black cloud (reason). Last time you saw a large black cloud like that one (example), what happened? Well, its the same now (application). It is definitely going to rain (conclusion).'

Let us try to unpick the *Nyāya-sūtra* definitions. Suppose we let 'F' denote the property that serves as the reason here (*hetu*), 'G' the property whose presence we are seeking to infer (*sādhya*), 'a' the new object about which we are trying to decide if it is G or not (*pakṣa*), and 'b' the cited example (*udāharaṇa*). Then we seem to have a pair of schematic inferences, one based on similarity, the other on dissimilarity:

Five-step proof based on similarity

[thesis]	*Ga*	
[reason]	*Fa*	proves *Ga*, because *b* is similar to *a.*
[example]	*b*	has the 'character of *a*' because it is similar to *a.*
[application]	*a*	is the same as *b* with respect to *G.*
[conclusion]	*Ga*	

Five-step proof based on dissimilarity

[thesis]	*Ga*	
[reason]	*Fa*	proves *Ga*, because *b* is dissimilar to *a.*
[example]	*b*	does not have the 'character of *a*' because dissimilar to *a.*
[application]	*a*	is not the same as *b* with respect to *G.*
[conclusion]	*Ga*	

The counter-proof follows the same pattern, proving the counter-thesis (¬ *Ga*) by means of a different reason and example:

Counter-proof

[thesis]	¬ *Ga*	
[reason]	*F'a*	proves *Ga*, because *b* is similar to *a.*
[example]	*c*	has the 'character of *a*' because it is similar to *a.*
[application]	*a*	is the same as *c* with respect to *G.*
[conclusion]	¬ *Ga*	

The five-step schema was interpreted in a particular way by Vātsyāyana, the first commentator on the *Nyāya-sūtra.* His interpretation is largely responsible for shaping the direction Indian logic was later to take. At the same time, it was an interpretation that made the citation of an example essentially otiose. Vātsyāyana was, in effect, to transform Indian logic, away from what it had been earlier, namely a theory of inference from case to case on the basis of resemblance, and into a rule-governed account in which the citation of cases has no significant role.

Let us then consider first Vātsyāyana's interpretation. What Vātsyāyana says is that the similarity between *a* and *b* just consists in their sharing the reason property *F*.[6] The basic pattern of inference is now: *a* is like *b* [both are *F*]; *Gb* ∴ *Ga*. *Or else: a* is unlike *b* [one is F and the other isn't]; ¬ *Gb* ∴ *Ga.* Writing it out as before, what we have is:

Proof based on similarity

[thesis]	*Ga*	
[reason]	*Fa*	
[example]	*Fb*	*b* is similar to *a* [both are *F*].
[application]	*Gb*	
[conclusion]	*Ga*	

In a counterproof, *a* is demonstrated to be similar in some other respect to some other example, one that lacks the property *G*:

Counterproof

[thesis]	¬ *Ga*	
[reason]	*F'a*	
[example]	*F'c*	*c* is similar to *a* [both are *F'*].
[application]	¬ *Gc*	
[conclusion]	¬ *Ga*	

Thus, for example, a proof might be: the soul is eternal because it is uncreated, like space. And the counterproof might be: the soul is non-eternal because it is perceptible, like a pot. The function of the example now is only to exemplify the proof relationship that exists between the properties F and G.[7]

The proposal is that if *a* resembles *b* in that both are *F*, and *b* is *G*, then *a* can be inferred to be *G* too. But there is an obvious difficulty, which is that mere resemblance is an insufficient ground in such an inference. Admittedly, the soul and space are both uncreated, but why should that give us any grounds for transferring the property of being eternal from one to the other? The *respect* in which the example and the case in hand resemble one another must be relevant to the property whose presence is being inferred. This is where the idea of a 'false proof' or 'false rejoinder' (*jāti*) comes in. Any argument that, while in the form of the five-step schema, fails this relevance requirement is called a 'false proof' and the *Nyāya-sūtra* devotes Book 5, Chapter 1 to

an exhaustive classification and analysis of them.[8] A 'false rejoinder' is defined in this way:

> NS 1.2.18: *sādharmya-vaidharmyābhyāṁ pratyavasthānaṁ jātiḥ.*—
> —'A *jāti* is an objection by means of similarity and dissimilarity.'

It appears to be admissible to transfer the property 'rain-maker' from one black cloud to another black cloud, but not from a black cloud to a white cloud. It appears to be admissible to transfer the property 'has a dewlap' from one cow to another cow, but not from one four-legged animal (a cow) to another (a horse). It is clear what now needs to be said. The argument is good if there exists a *general* relationship between the reason *F* and the property being proved *G*, such that the latter never occurs without the former.

It is the Buddhist logician Diṅnāga (480–540 CE) who seems to have been the first to make this explicit. According to him, a reason must satisfy three conditions. Define a 'homologue' (*sapakṣa*) as an object other than *a* that possesses *G*, and a 'heterologue' (*vipakṣa*) as an object other than *a* that does not possess *G*. Then Diṅnāga's three conditions on a good reason are:

[1] *F* occurs in *a*.
[2] *F* occurs in some homologue.
[3] *F* occurs in no heterologue.

Condition [3] asserts, in effect, that *F* never occurs without *G*, and this, together with [1] that *F* occurs in *a*, implies of course that *G* occurs in *a*. In effect, the citation of an example in the original *Nyāya-sūtra* formula has been transformed into a statement of a general relationship between *F* and *G*. There remains only a vestigial role for the example in condition [2], which seems to insist that there be an instance of *F* other than *a* which is also *G*. Diṅnāga is worried about the soundness of inferences based on a reason which is a property unique to the object in hand; for example, the inference 'sound is eternal because it is audible.' For if this is sound, then why not the counter-argument 'sound is non-eternal because it is audible'? And yet there are many inferences like this that are sound, so it seems to be a mistake to exclude them all. In fact condition [2] soon came to be rephrased in a way that made it logically equivalent to [3], namely as saying that *F* occur only in homologues (*eva* 'only' is used here as a quantifier). In asking for the respect in which the example and the new case must resemble each other, for the presence of *G* in the example to be a reason for inferring that *G* is

present in the new case, we are led to give the general relationship that any such respect must bear to *G*, and that in turn makes citation of an example otiose. The five-step schema becomes:

[thesis]	*Ga*
[reason]	because *F*
[example]	where there is *F*, there is *G*, for example, *b*.
[application]	*Fa*
[conclusion]	*Ga*

It is the five-step argument pattern so transformed that has suggested to Henry COLEBROOKE and other writers on Indian logic a comparison with an Aristotelian syllogism in the first figure, *Barbara*. We simply re-write it in this form:

All *F* are *G*.
Fa.
Therefore, *Ga*.

This assimilation seems forced in at least two respects. First, the conclusion of the *Nyāya-sūtra* demonstration is a singular proposition. In Aristotle's system, on the other hand, it is always either a universal proposition with 'all' or 'no', or a particular proposition with 'some'. Second, and relatedly, the role of the 'minor term' is quite different: in the Indian schema, it indicates a locus for property-possession, while in Aristotle, the relation is 'belongs to'. Again, in reducing the Indian pattern to an Aristotelian syllogism, the role of the example, admittedly by now rather vestigial, is made to disappear altogether.

A rather better reformulation of the five-step schema is suggested by Stanisław SCHAYER (1933), who wants to see the Indian 'syllogism' as really a proof exploiting two rules of inference:

[thesis]	Ga	There is fire on *a* (= on this mountain).
[reason]	Fa	There is smoke on *a*.
['example']	$(x)(Fx \rightarrow Gx)$	For every locus *x*: if there is smoke in *x* then there is fire in *x*.
[application]	$Fa \rightarrow Ga$	This rule also applies for $x = a$.
[conclusion]	Ga	Because the rule applies to $x = a$ and the statement *Ga* is true, the statement *Fa* is true.

Two inference rules are in play here—a rule of substitution, allowing us to infer from '$(x)\zeta x$' to 'ζa', and a rule of separation, allowing us to infer from '$\theta \rightarrow \phi$' and 'θ' to 'ϕ'. SCHAYER thereby identifies the Indian syllogism with a proof in a natural deduction system:

Thesis:		Ga	because Fa.
Proof:	(1)	Fa	Premise
	(2)	$(x)(Fx \rightarrow Gx)$	Premise
	(3)	$Fa \rightarrow Ga$	2, by $\forall$ Elimination
	(4)	Ga	1 & 3, by $\rightarrow$ Elimination. QED.

We have seen how the *Nyāya-sūtra* model of good argumentation came to be transformed and developed by later writers in the Indian tradition in the direction of a formal, rule-governed theory of inference, and how writers in the West have interpreted what they have called the Indian 'syllogism'. I suggested at the beginning that we might try to interpret the early Nyāya model along different lines altogether, seeing it an early attempt at what is now called 'case-based reasoning'. Case-based reasoning begins with one or more prototypical exemplars of a category, and reasons that some new object belongs to the same category on the grounds that it resembles in some appropriate and context determined manner one of the exemplars. Models of case-based reasoning have been put forward for medical diagnostics and legal reasoning,[9] and some have been implemented in artificial intelligence models.[10] Perhaps something like this underlies a lot of the way we actually reason, and perhaps it was as an attempt to capture this type of reasoning that we should see the ancient logic of the *Nyāya-sūtra* and indeed of the medical theorist Caraka[11]. In this model, a perceived association between symptoms in one case provides a reason for supposing there to be an analogous association in other, resembling cases. The physician observing a patient A who has, for example, eaten a certain kind of poisonous mushroom, sees a number of associated symptoms displayed, among them F and G, say. He or she now encounters a second patient B displaying a symptom at least superficially resembling F. The physician thinks back over her past case histories in search of cases with similar symptoms. She now seeks to establish if any of those past cases resembles B, and on inquiry into B's medical history, discovers that B too has consumed the same kind of poisonous mushroom. These are her grounds for inferring that B too will develop the symptom G, a symptom that had been found to be

associated with F in A. A common aetiology in the two cases leads to a common underlying disorder, one that manifests itself in and explains associations between members of a symptom-cluster.

Can we find such a model of the informal logic of case-based reasoning in the *Nyāya-sūtra*? Consider again *Nyāya-sūtra* 1.1.34. It said that 'the reason is that which proves what is to be proved in virtue of a similarity with the example.' On our reading, what this says is that a similarity between the symptom F in the new case and a resembling symptom F' in the past-case or example is what grounds the inference. And *Nyāya-sūtra* 1.1.36 says that 'the example is something which, being similar to that which is to be proved, has its character.' Our reading is that the old case and the new share something in their circumstances, like having eaten the same kind of poisonous mushroom, in virtue of which they share a 'character', an underlying disorder that explains the clustering of symptoms. So the five-step demonstration is now:

[thesis]	Ga	
[reason]	Fa	F is similar to F' in b.
[example]		b exhibits the same underlying structure as a, because it resembles a.
[application]		a is the same as b with respect to G.
[conclusion]	Ga	

Let us see if this pattern fits examples of good inference taken from a variety of early Indian logical texts. One pattern of inference, cited in the *Nyāya-sūtra*, is causal-predictive: Seeing the ants carrying their eggs, one infers that it will rain; seeing a full and swiftly flowing river, one infers that it has been raining; seeing a cloud of smoke, one infers the existence of an unseen fire. Presumably the idea is that one has seen other ants carrying their eggs on a past occasion, and on that occasion it rained. The inference works if, or to the extent that, we have reasons for thinking that those ants and these share some unknown capacity, a capacity that links detection of the imminent arrival of rain with the activity of moving their eggs. The pattern is similar in another kind of inference attested in the early texts, inference from sampling: inferring from the salty taste of one drop of sea water that the whole sea is salty; inferring that all the rice is cooked on tasting one grain. The assumption again is that both the sampled grain of rice and any new grain share some common underlying structure, a structure in virtue of which they exhibit the syndromes associated with being cooked, and a structure

whose presence in both is indicated by their being in the same pan, heated for the same amount of time, and so forth.[12]

One might argue that the function of the example in such cases of inference from sampling is to be a 'typical' or 'normal' member of the kind, one whose resemblance to the object under investigation ensures that the latter too satisfies typicality constraints. This seems to be the approach of Claus OETKE (1996), who interprets *Nyāya-sūtra* 1.1.32–39 within the framework of a Default Logic. Thus, 'On this background a possible role of the third member, the example, becomes apparent. It possesses the function of giving an empirical foundation and justification of (relevant) normality-assumptions. The fourth member, on the other hand, can be understood as expressing the claim that the entity which is concerned in a particular case fulfils the relevant normality-conditions' (p. 479). He distinguishes between three types of acceptability standard, corresponding roughly to three phases in the historical development of Indian logic, of which Type 1, the type to which the *Nyāya-sūtra* analysis belongs, is distinguished in that 'it is required that *probans* and *probandum* are related in such a way that the latter ensues from the former on condition that the pertinent case can be regarded as conforming to normality' (p. 486). OETKE concedes that 'as far as is known, no explicit formulation of the acceptability criteria and principles which characterise this type is to be found in the texts' (p. 487), and it is for this very reason that I am doubtful of the 'typicality' approach to understanding the role of the example. I agree with OETKE, however, that it is not necessary to assume that the respect in which the example and the object under investigation resemble one another is in their sharing the reason-property (p. 479), i.e. that Vātsyāyana's interpretation of the *sūtra*s is the only one, or necessarily the correct one.

I will make two final comments about these patterns of case-based reasoning. First, it is clear that background knowledge is essentially involved. As the *Nyāya-sūtra* stresses in its definition of a good debate, both parties in a debate must be able to draw upon a commonly accepted body of information. Such knowledge gets implicated in judgements about which similarities are indicative of common underlying disorders, and which are not. Second, in such reasoning the example does not seem to be redundant or eliminable in favour of a general rule. For although there always will be a general law relating the underlying disorder with its cluster of symptoms, the whole point of this pattern of reasoning is that the *reasoner* need not be in a position to *know* what the underlying disorder is, and so what form the general law

takes. In conclusion, while the history of logic in India shows a strong tendency towards formalisation, the logic of ancient India tried to model informal patterns of case-based reasoning, patterns that are increasingly becoming recognised as widespread and representative of the way much actual reasoning takes place.[13]

NOTES

[1] COLEBROOKE (1824)).
[2] GANERI (2001b).
[3] GANERI (2001a: chapter 4).
[4] INGALLS (1951: 65–67), GANERI (1999: 118–122).
[5] WALTON (1998).
[6] NBh 31.10–11 (under *Nyāya-sūtra* 1.1.34): *udāharaṇena sāmānyāt sādhyasya dharmasya sādhanaṁ prajñāpanaṁ hetuḥ. sādhye pratisandhāya dharmam udāharaṇe ca pratisandhāya tasya sādhanatā-vacanaṁ hetuḥ.*
[7] NBh 32.17 (under NS 1.1.36): *udāhriyate 'nena dharmayoḥ sādhya-sādhana-bhāva ity udāharaṇam.* NBh 35.14 (under NS 1.1.39): *dharmayoḥ sādhya-sādhana-bhāva-pradarśanam ekatrôdāharaṇârthaḥ.* NBh 31.19–21 (under NS 1.1.39): *vyavasthite hi khalu dharmayoḥ sādhya-sādhana-bhāve dṛṣṭāntasthe gṛhyamāṇe sādhana-bhūtasya dharmasya hetutvenôpādānaṁ na sādharmya-mātrasya na vaidharmya-mātrasya vêti.* NS 5.1.34 is similar: *dṛṣṭānte ca sādhya-sādhana-bhāvena prajñātasya dharmasya hetutvāt tasya côbhayathâbhāvān nâviśeṣaḥ*—'because a reason is a property recognised in the example as being in the nature of a proof relation, and because it has the nature of both [similarity and dissimilarity], [there is] no lack of distinction [between good and bad arguments]'; but this may only add support to the conjecture that Book 5.1 of the *Nyāya-sūtra* is a later interpolation into the text—see MEUTHRATH (1996).
[8] A recent text-critical study by A. MEUTHRATH (1996: 232 ff.) concludes that Books 1.1, 1.2 and 5.2 constitute a distinguishable unit, while Book 5.1 probably a later insertion into the text.
[9] LEVI (1949: 1–2): 'The basic pattern of legal reasoning is reasoning by example. It is reasoning from case to case. It is a three-step process described by the doctrine of precedent in which a proposition descriptive of the first case is made into a rule of law and then applied to a next similar situation. The steps are these: similarity is seen between cases; next the rule of law inherent in the first case is announced; then the rule of law is made applicable to the second case'. STICH (1988: 402): 'Perhaps our intuitive notion of justification is tied to a number of prototypical exemplars, and that in deciding new cases we focus in some context sensitive way on one or another of these exemplars, making our decision about justification on the basis of how similar the case in hand is to the exemplar on which we are focussing'.
[10] KOLODNER (1992), KOMATSU (1992), COHEN–MURPHY (1984).
[11] CS 3.8.34: *atha dṛṣṭāntaḥ—dṛṣṭānto nāma yatra mūrkha-viduṣāṁ buddhi-sāmyaṁ, yo varṇyam varṇayati. yathā—agnir uṣṇaḥ, dravam udakaṁ, sthirā pṛthivī, ādityaṁ prakāśaka iti; yathā ādityaḥ prakāśakas tathā sāṁkhya-jñānaṁ prakāśakam iti*—'what is called "example" is that in which both the ignorant and the wise think the same and that which explicates what is to be explicated. As for instance, "fire is hot," "water is wet," "earth is hard," "the sun illuminates." Just as the sun illuminates, so knowledge of *sāṁkhya* philosophy illuminates'.
[12] See Śabara under MS 7.4.12, where this example is mentioned and discussed.

[13] For example, I believe it can be shown that much moral deliberation and practical reasoning in ancient India follows the case-based paradigm. See GANERI (forthcoming).

BIBLIOGRAPHY

BALCEROWICZ–MEJOR 2000	=	Balcerowicz, Piotr & Mejor, Marek (eds.): *On the Understanding of other cultures. Proceedings of an International Conference on Sanskrit and Related Studies to Commemorate the Centenary of the Birth of Stanisław Schayer (1899–1941), Warsaw University, Poland, October 7–10, 1999. Studia Indologiczne* 7 (2000), Instytut Orientalistyczny, Uniwersytet Warszawski, Warsaw 2000.
COHEN–MURPHY 1984	=	Cohen, B. & Murphy, G. L.: 'Models of concepts'. *Cognitive Science* 8 (1984) 27–58.
COLEBROOKE 1824	=	Colebrooke, H. T.: 'On the Philosophy of the Hindus: [Part II]: On the Nyāya and Vaiśeshika systems'. *Transactions of the Royal Asiatic Society* (1824) 1: 92–118. [reprinted in GANERI (2001c: 26–58)].
CS	=	*Caraka-saṁhitā*. **???which edition**
FORRESTER 1996	=	Forrester, John: 'If p, then what? Thinking in cases'. *History of the Human Sciences* 9 (1996) 1–25. **???this does not seem to be quoted**
GANERI 1999	=	Ganeri, Jonardon: *Semantic Powers: Meaning and the Means of Knowing in Classical Indian Philosophy*. Clarendon Press, Oxford 1999.
GANERI 2001a	=	Ganeri, Jonardon: *Philosophy in Classical India: The Proper Work of Reason*. Routledge, London 2001.
GANERI 2001b	=	Ganeri, Jonardon: 'Argumentation, Dialogue and the *Kathāvatthu*.' *Journal of Indian Philosophy* 29 (2001) 485–493.
GANERI 2001c	=	Ganeri, Jonardon (ed.): *Indian Logic: A Reader*, Curzon, London 2001.
GANERI (forthcoming)	=	Ganeri, Jonardon: 'The stability of goodness: *dharma*, dialectics and moral deliberation.'
INGALLS 1951	=	Ingalls, D. H. H.: *Materials for the Study of Navya-Nyāya Logic*. Harvard University Press, Harvard 1951.
KOLODNER 1992	=	Kolodner, Janet L.: 'An introduction to case-based reasoning'. *Artificial Intelligence Review* 6 (1992) 3–34.
KOMATSU 1992	=	Komatsu, L. K.: 'Recent views of conceptual structure'. *Psychological Bulletin* 112 (1992) 500–526.
LEVI 1949	=	Levi, Edward H.: *An introduction to legal reasoning*. Chicago University Press, Chicago IL 1949.
MEUTHRATH 1996	=	Meuthrath, Annette: *Untersuchungen zur Kompositionsgeschichte der Nyāyasūtras*. Würzburg 1996.
MS	=	Jaimini: *Mīmāṁsā-sūtra*.
Nbh	=	Vātsyāyana Pakṣilasvāmin: *Nyāya-bhāṣya*.
NS	=	Akṣapāda Gautama: *Nyāya-sūtra*.
OETKE 1996	=	Oetke, Claus: 'Ancient Indian Logic as a Theory of Non-Monotonic Reasoning,' *Journal of Indian Philosophy* 24 (1996) 447–539.

PRETS 2000 = Prets, Ernst: 'Theories of Debate, Proof and Counter-Proof in the Early Indian Dialectical Tradition'. In BALCEROWICZ–MEJOR (2000: 369–382). **???this does not seem to be quoted**

PRETS (forthcoming) = Prets, Ernst: 'Proof and counterproof in early Indian dialectic and logic.' **???this does not seem to be quoted**

SCHAYER 1933 = Schayer, Stanisław: 'Über die Methode der Nyāya-Forschung', in O. Stein and W. Gambert (eds.) *Festschrift für Moritz Winternitz*, Leipzig 1933: 247–257. [Translated by Joerg Tuske in GANERI (2001c: 102–109)].

STICH 1988 = Stich, Stephen: 'Reflective equilibrium, analytic epistemology and the problem of cognitive diversity'. *Synthese* 74 (1988) 391–413.

WALTON 1998 = Walton, Douglas: *The New Dialectic: Conversational Contexts of Argument*. University of Toronto Press, Toronto 1998.